

Technical article

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GF Machining Solutions' latest-generation GF Laser Workstation Software revolutionizes Laser texturing by guaranteeing both quality and productivity

Users of GF Machining Solutions' AgieCharmilles Laser texturing solutions are reaching new levels of process intelligence and efficiency with the advanced patching generation included in version 1.8.0 of the GF Laser Workstation Software. This is because this optional software suite—the market reference for Laser texturing software—includes this GF Division's new Smartpatch technology to advance both quality and productivity.

GF Machining Solutions, already a technical leader in aesthetic Laser texturing, is committed to pushing the boundaries of this technology that has been part of its multi-technology portfolio since 2010. Today, this GF Division takes its Laser texturing solution a step further into the future with the proven smart machining strategies, increased quality and optimized productivity integrated into Smartpatch.

In today's highly competitive and fast-moving mold and die environment, manufacturers do not have a moment to waste in their processes and cannot afford to compromise on quality: They are under increasing pressure to produce the highest quality textured surfaces on the first attempt in order to reduce their turnaround time, keep their costs in check, and maintain their reputation for producing high-quality work.

Laser texturing applies textures to workpieces by using a Laser beam to remove workpiece material layer by layer in a non-polluting, no-contact way. The technology has proven itself as a sustainable means of applying decorative textures, including complex geometries, over infinite iterations with highest repeatability because the process is fully digital. This means that virtually any design in a digital format can easily be applied to a 3D workpiece surface. Furthermore, since the cutting tool is a Laser beam, tool wear and breakage are never an issue. Challenges still exist however, and GF Machining Solutions has emerged in the past seven years as Laser texturing technology's technical leader by resolving those challenges with intelligent texturing technologies.

The challenge

A significant hurdle is the scattershot approach of conventional Laser texturing solutions. To date, even the most advanced Laser texturing solutions have forced manufacturers to make some sacrifices in terms of either quality or productivity. This is because most existing Laser texturing machines randomly apply textures to the workpiece surface, working from one area to the next to remove material in patches. Without a smart patching solution, productivity and quality are compromised due to inefficient texturing strategies and texturing errors induced by the movement of the Laser head. Every patch or section of texture requires the machine head to move. Movement can induce position

deviations from the desired texture design due to thermal changes in the environment around the machine. This can result in undesirable lines along the perimeters of patches and distorted textural details (see figure 1). These deviations lead to quality errors that are especially noticeable on very fine textures such as injection molded automotive interiors; watches; information and communications technology (ICT) products; and many other challenging applications.

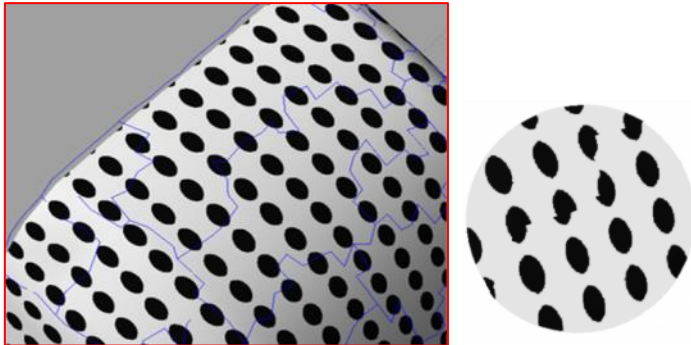


Figure 1

The solution

To establish the revolutionary quality- and productivity-enhancing advantages of Smartpatch, GF Machining Solutions' Laser Research and Development team developed a highly demanding stainless steel demo part featuring a complex honeycomb texture (see figure 2).



Figure 2

Without Smartpatch, this workpiece required 30 times more patches; with Smartpatch a customer can produce the same workpiece with 30 times fewer machine movements than with a program generated by standard methods.

Figure 3 shows how a standard Laser process will machine a texture from the first layers to the last one, in comparison to figure 4 showing where Smartpatch detects a “pocket” (one area where the texture could be unlinked and where the texture’s detail could be realized in a single movement). As soon as a pocket is detected, the machine makes a patch around it and executes all the layers of this pocket to finish it, sometimes with even fewer layers than were needed in the past.

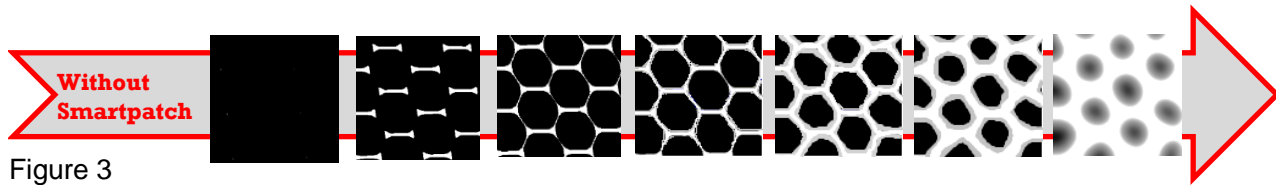


Figure 3

With the intelligent machining strategies embedded in Smartpatch, texturing productivity and quality are significantly increased as shown in figure 4 because machine movements are reduced by the number of layers of the targeted texture.

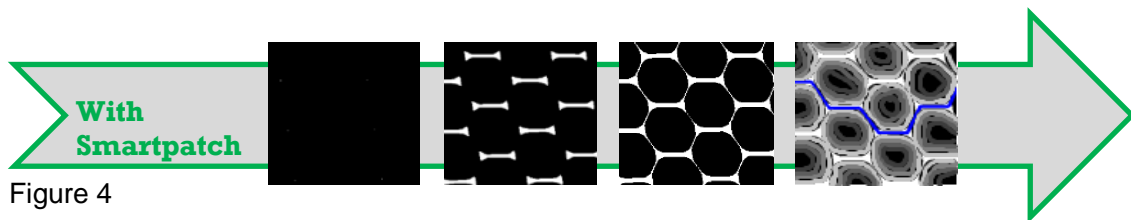


Figure 4

Smartpatch reduces machine movements by analyzing the desired texture in advance and manages the machining process to eliminate movement-induced deviations from the desired texture.

Due to the intelligence built into Smartpatch, random application of textures (see figure 5) becomes a thing of the past because the Laser head movement is minimized to deliver highly efficient texturing and high-quality results. In figure 5, each color represents a machine movement in machining of the volcano workpiece without Smartpatch and illustrates the efficiency lost by repositioning the Laser head for each detail of the texturing application.

Without Smartpatch, as shown in Figure 5 (left side), for each layer, the texture's details are split randomly by a patch. Each patch is one machine movement. This influences the final part's quality since on fine texturing, each patch generates a new machine movement and the thermal changes can generate shifts in position.

Smartpatch starts and finishes one detail of the texture in a single movement, decreasing the number of patches executed by the numbers of layers set up by the customer and avoiding the risk of positioning deviation and consequent quality deviation.

Figure 5 clearly shows the efficiency gained by using Smartpatch's smart generation of Laser patches.

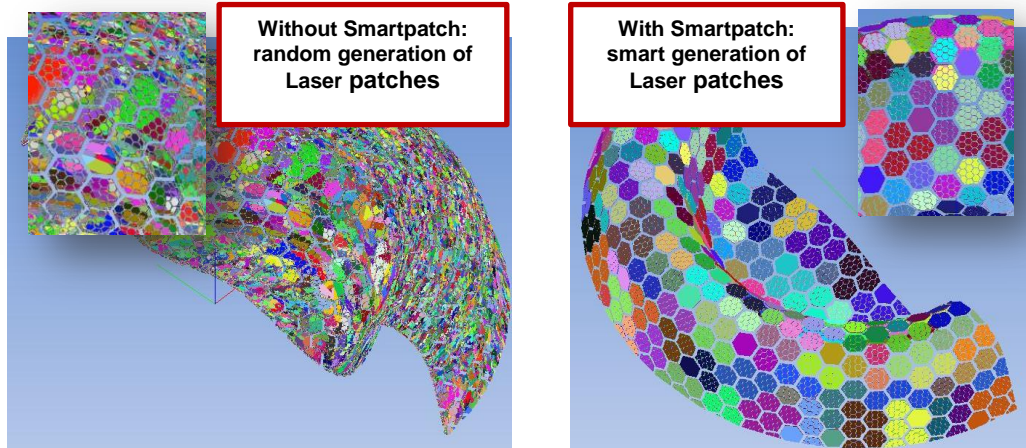


Figure 5

An additional quality-advancing benefit of Smartpatch is its ability to avoid patching lines and perfectly respect the desired geometry of the workpiece, as seen in figure 6. It also shows the vast differences between texturing with and without Smartpatch. The image on the left shows that the texture's borders are cropped as a result of the many random patches generated on each machined layers. The image on the right proves the respect for detail delivered by Smartpatch's ability to machine successive layers without repositioning the Laser head.

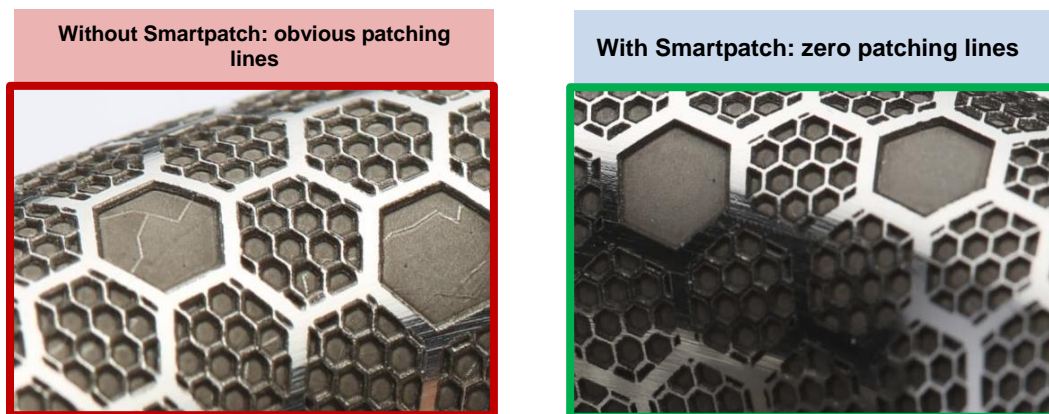


Figure 6

Figure 7: This is a sectional view of the texture without Smartpatch where we can clearly see the geometry shift compared to the one with Smartpatch (Figure 8) where the slope is much more regular.

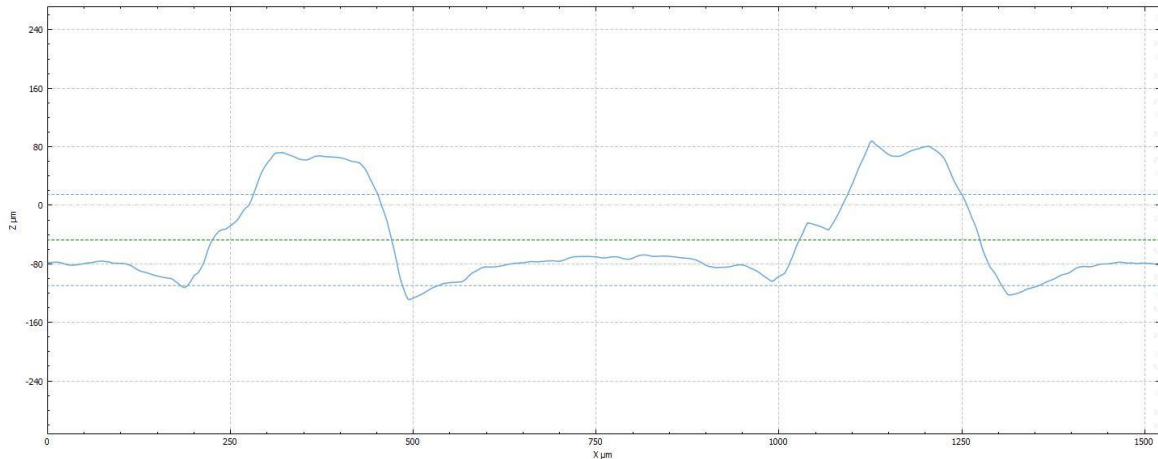


Figure 7

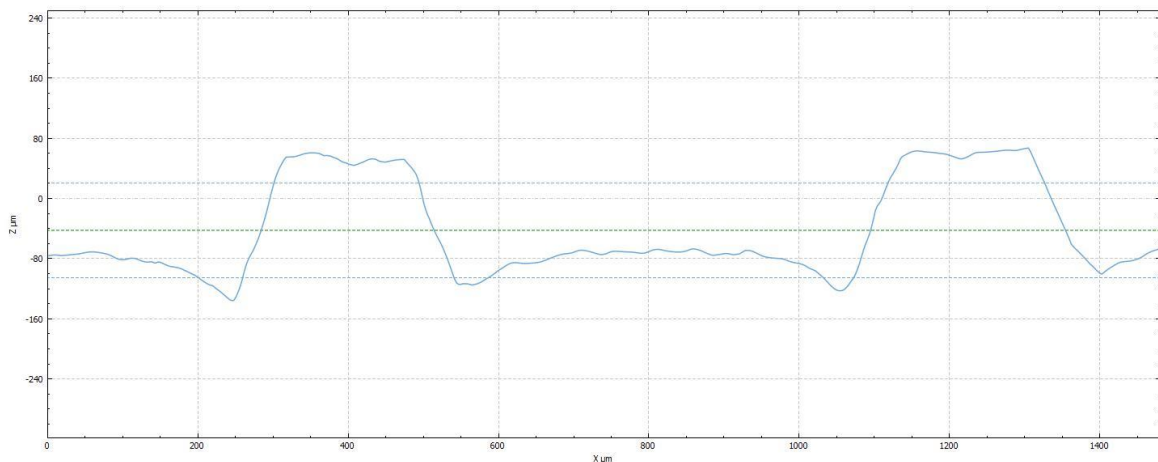


Figure 8

With the texturing efficiency enabled by Smartpatch, the volcano demo part was machined with the objective of achieving the best quality. A 30 percent faster process was achieved, compared to machining without the Smartpatch machining strategy (with a 30-watt, nanosecond Flexipulse fiber laser source).

In addition to GF Machining Solutions' own tests, feedback from Smartpatch users in industry confirms these results. An Italian user of the AgieCharmilles LASER P 1000 U and AgieCharmilles LASER P 1200 U reported that Smartpatch benefits 50 percent of his production with Laser texturing. Furthermore, the same user reported that Smartpatch helps his business achieve much better quality and productivity—a truly revolutionary achievement that only Smartpatch can guarantee.

A Smartpatch user in Germany reported that his productivity increased 20 percent when using Smartpatch to execute a five-axis Laser textured part for automotive. This customer reported a 40 percent increase in productivity on a three-axis engraving application for automotive.

Conclusion

The intelligent machining strategies enabled by the Smartpatch technology in GF Machining Solutions' AgieCharmilles Laser Workstation revolutionize Laser texturing by advancing both quality and

productivity. This solution does this by executing the most efficient patching strategies that reduce movement of the Laser head to significantly decrease the possibility of movement-induced errors and patching lines. Smartpatch underscores GF Machining Solutions as the global reference and technical leader in Laser texturing.

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Profile of GF Machining Solutions

GF Machining Solutions is the world's leading provider of machines, diverse technical solutions and services not only to the tool and mold making industry but also to manufacturers of precision components. The products range from electrical discharge machines, high-speed and high-performance Milling machines—including clamping and palletization systems, 3D Laser surface texturing machines and Spindles—to solutions for Tooling and Automation, services, spare parts, expendable parts and consumables. GF Machining Solutions is a globally acting Division of the Georg Fischer Group (Switzerland) and maintains a presence on 50 sites worldwide within its own organization. Its 3'102 employees generated sales of CHF 916 million in 2016. More information can be found at www.gfms.com.

